

Title: Agent 313 Solvation Chemistry Technology

Lead PI/Affiliation: Commodore Environmental Services, Inc.

Co-PI's/Affiliations:

Date/Duration:

Initiated - 04/96

Completed - 09/98



Abstract:

Solvated electron chemistry technology is an innovative environmental cleanup process that uses a solution of ammonia and an "active" metal to create a powerful reducing agent that can chemically transform toxic contaminants, such as polychlorinated biphenyls (PCBs) and pesticides, into relatively benign substances.

The process consists of placing the contaminated soil into a reactor and adding first liquid ammonia and then a metal, usually sodium. When the process is complete, the environmentally harmful elements have been chemically converted to harmless salts and other substances, while the soil has been left clean enough to be returned to the environment.

Soils, sediments, liquids, and other materials that have been contaminated by PCBs, pesticides, and other halogenated compounds can be effectively cleaned upon being combined with a solution of solvated electrons. A solvated electron solution is a liquid homogenous mixture producing a large supply of free electrons. Combining liquid ammonia with a metal such as sodium, calcium, lithium, or potassium can create it. When a solvated electron solution is mixed with a contaminated material, the free electrons in the solution chemically convert the contaminant to relatively harmless substances and salts.

The solvated electron remediation system consists of components (tanks, pumps and piping) to handle and recover the ammonia, along with reactor vessels for holding the contaminated soil and introducing the solvating solution. The system can be transported to various field sites. However, the process is performed *ex-situ*, which means the contaminated soil, or other material, must be placed in the reactor vessels.

The demonstration was designed to reveal performance capability, determine potential scale-up costs, and evaluate design parameters. In addition, operational guidance and technology transfer documents were to be developed during the investigation.

Results/Conclusions:

The results of this demonstration and others indicated that solvated electron technology destroys PCBs and pesticides as follows: PCB in oil 160,000 - 140,000ppm → < 1ppm, PCB in soil 900 - 1,311 ppm → < 1ppm, and pesticides in soil (4,4-DDT, 4,4-DDD, 4,4-DDE dieldrin, and chlordane) 0.9 - 240ppm → < 0.02ppm. Treatment costs at production rates are projected to be \$400 to \$700 per ton.

Publications:

- 1) Commodore Environmental Services, Inc., "Rapid Commercialization Initiative Treatability Study Series at the Naval Construction Battalion Center, Port Hueneme, California", May 1998.
- 2) Getman, G., Commodore Solution Technologies, Inc., "Application of the SolVTM Process: A Total Systems Approach to Environmental Remediation", pp. 17-27, 1998.
- 3) Getman, G., Commodore Applied Technologies, Inc., "Treating Toxic Mixed Wastes Without Incineration, April 1998.